REMARKS

Claim 11 was objected to because of informalities. Claims 7 to 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No.: 4,649,023 to Sabol et al. ("Sabol") in view of U.S. Patent No.: 5,832,050 to Rebeyrolle et al. ("Rebeyrolle") and either U.S. Patent No.: 4,171,992 to Tanner et al. ("Tanner") or U.S. Patent No.: 5,478,419 to Dumas et al ("Dumas"). Claims 7 to 12 were provisionally rejected on the ground of nonstatuatory obviousness-type double patenting as being unpatentable over claims 13 to 16 of copending Application No. 10/885,927.

Claim 11 has been amended.

Reconsideration of the application based on the following remarks is respectfully requested.

Claim Objections

Claim 11 was objected to because of a perceived informality.

Claim 11 has been amended to correct the informality. The applicant thanks the Examiner for pointing out this typographical error.

Withdrawal of the objection to claim 11 is respectfully requested.

35 U.S.C. 103(a) Rejections

Claims 7 to 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sabol in view of Rebeyrolle and either Tanner or Dumas.

Sabol discloses a process for fabricating a zirconium-nobium alloy. "The alloys are beta-quenched and subsequently treated at lower temperatures than normal annealing temperatures and fabricating steps. In formation of tubing, for example, the beta-quenched alloy is extruded at a temperature at or below 650°C and between subsequent cold working steps, the article is subjected to cold working anneals at a temperature at or below 650°C. The resultant article is given a final anneal at a temperature also below 650°C, and preferably around 500°C." (Column 2, lines 16 to 24).

Rebeyrolle discloses "zirconium-based alloy for the manufacture of elements used in a nuclear reactor and to the elements produced from this alloy." (Column 1, lines 6 to 8).

Tanner discloses the preparation go zirconium alloys containing at least two of the transition metal elements of iron, cobalt and nickel." (See Abstract).

Dumas discloses a process for the manufacturing of a flat product of zirconium alloy comprising heating in the ß range with infra-red lamps.

Claim 7 recites "[a] method of manufacturing tubes intended for making all or the external part of a sheathing tube for a nuclear fuel rod or a guide tube for a nuclear fuel assembly, comprising:

forming a bar of a zirconium based alloy which also contains;

0.03 to 0.25% in total firstly of iron;

secondly, at least one of the elements selected from the group consisting of chromium and vanadium;

0.8 to 1.3% of niobium;

less than 2000 ppm of tin;

500 to 2000 ppm of oxygen;

less than 100 ppm of carbon;

5 to 35 ppm of sulfur; and

less than 50 ppm of silicon;

quenching the bar in water after heating to between 1000° and 1200°C;

extruding a blank after heating to a temperature of between 600°C and 800°C;

cold-rolling said blank in at least four passes to obtain a tube, with intermediate heat treatments between 560°C and 620°C; and

applying a final heat treatment between 560°C and 620°C, all the heat treatments being applied in an inert atmosphere or under vacuum."

Neither Sabol nor Rebeyrolle teach or show the claim requirement that "all the heat treatments being applied in an inert atmosphere or under vacuum," that is recited in claim 7. Furthermore, one of skill in the art would have no reason or motivation to combine the teachings of Sabol in view of Rebeyrolle with either Tanner or Dumas Tanner has nothing to do with the present invention. Tanner discloses making Zr-Fe-Co, Zr-Fe-Ni or Zr-Co-Ni alloys in the shape of ribbons. The alloy is melted, then rapidly cooled to obtain a solid ribbon having an amorphous structure, then heated over its crystallization temperature so as to obtain a polycrystalline phase. One of skill in the art knows that amorphous ribbons have thicknesses

thicknesses of some fraction of millimeters after they are solidified. Such low thicknesses are necessary, in combination with the very fast quenching speed and an appropriate composition, for obtaining the required amorphous structure. These thicknesses are lower then the dimensions of the tubes in the present invention, which in addition, must undergo several shaping steps after the original ingot has been cast. The tubes manufactured according to the present invention can have walls 0.4 to 1.5mm thick and an external diameter of 6 to 20mm, with the actual size determined by the reactor in which they will be used. The ribbons of Tanner, on the contrary, are not shaped and are used with their as-cast dimensions. Furthermore, these alloys in Tanner have compositions very remote from the present invention. They are much richer in elements other then Zr wherein the present invention tolerates less than 2% of such elements. In addition, Tanner contains no Nb which is the essential alloying element of the invention. Finally, the Office Action cites a step of Tanner referring to the melting/solidification of the material as corresponding to "being applied in an inert atmosphere or under vacuum." Indeed, this step in Tanner takes place under a vacuum or in an inert atmosphere; however, this step has nothing to do with the thermal treatments of the already solidified product which, in the present invention, must take place under vacuum or in an inert atmosphere. The thermal treatment steps in the inert gas of the present invention have no equivalent in Tanner. Likewise, Dumas teaches a method for the manufacture of a **flat** product which is inapplicable to the manufacture of a tube as presently claimed. There is no reason or motivation that one of skilled in the art would modify Sabol in view of Rebeyrolle and the flat products of Dumas. Tubes used in nuclear reactors require different manufacturing processes due to their compositions. As discussed above, there is no reason or motivation for one of skill in the art to combine the teachings of Sabol in view of Rebeyrolle with either Tanner or Dumas given the disparate teachings of these references.

Furthermore, with regards to claims 9 and 10, Cr, Mo, V, Cu, Ni and W cannot be considered as completely equivalent to Fe as for their effects on the properties of the alloys. Cr is not equivalent to Fe in that it causes significant changes in the intermetallic phase $Zr(Nb, Fe, Cr)_2$, which can lead to some lowering of the corrosion resistance if the Cr content is too high (over 250 ppm). For a Fe/Cr ratio about 30, corrosion at 400°C in water is not much affected

much affected by Cr. But generally speaking the corrosion resistance at 400°C is better if the ratio Fe/(Cr+V) is high. (See specification page 4, line 27 to page 5, line 8). So it cannot be said that Cr and Fe would be replaceable by each other. It is respectfully submitted that if Cr and Fe were replaceable by one another (which the applicant does not agree with) there would be no need to optimize the Fe/Cr ratio as in claims 9 and 10, only the sum Fe+Cr should have to be considered.

Also, V has a marked effect on the hydrogen absorption by the alloy. Replacing some of the Fe by V, up to 25% of V, causes a delay in the recrystallization and a slight reduction of the grain size. The density of the intermetallic compounds is diminished and their composition is modified. A consequence is that an increase in V is somewhat detrimental to all kinds of corrosion. But in some instances, in particular at the highest temperatures, hydrogen absorption is diminished by the presence of V, so that one of the main drawbacks of Zr-1%Nb alloys can be attenuated.

Concerning Ni and Cu, they do not form the same precipitates as Cr and Fe. They form $Zr_2(Fe,Ni)$ or $Zr_2(Fe,Cu)$. Mo has a behavior comparable to Cr.

In view of this, it is furthermore respectfully submitted that one of skill in the art would not have modified Sabol in view of Rebeyrolle and Tanner or Dumas, because the concentrations of Sabol are specifically to that alloy and altering such alloy can alter the properties derived by Sabol.

Claims 7 to 12 were rejected on the ground of nonstatuatory obviousness-type double patenting as being unpatentable over claims 13 to 16 of copending Application No. 10/885,927.

This obviousness-type double patenting rejection has been noted by the Applicants. If these provisional double patenting rejections are the only remaining rejections upon entry of the present amendment, then in accordance with M.P.E.P. §804.I.B.1, applicants would request withdrawing these provisional rejections.

Withdrawal of the rejection of independent claim 7 on the ground of nonstatuatory obviousness-type double patenting and dependent claims 8 to 12 is respectfully requested

CONCLUSION

It is respectfully submitted that the application is in condition for allowance and applicants respectfully request such action.

If any additional fees are deemed to be due at this time, the Assistant Commissioner is authorized to charge payment of the same to Deposit Account No. 50-0552.

Respectfully submitted,

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By: _____

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